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410657

OPERATION CASTLE

A PRELIMINARY REPORT OF [redacted] SHOT

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OPERATION CASTLE

THIS DO[redacted]

A PRELIMINARY REPORT OF THE RESULTS OF [redacted] SHOT

Submitted by

Task Group 7.1

[redacted]

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31 MAR - 10 APR 1954
(Date)

[redacted]

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INTRODUCTION

This report is a preliminary report and, therefore, does not give either complete or final results of the work of the various projects. It should furnish the reader, however, with a fair idea of the overall picture. No information on the construction of the device is included in order that the classification may be kept to Secret, Restricted Data. Descriptions of the device may be found elsewhere.*

[redacted] was detonated on Namu Island of Bikini Atoll at approximately 6:45 a.m., 1 March 1954, local time. It was fired on the ground in order to facilitate the performance of various experiments.

The experimental program was designed to give information on various subjects. The major features of the program covered the subjects of total energy release, fission yield, alpha of the primary device, the interval between primary and secondary reactions, propagation rate of the burning, shock pressures, gamma and neutron intensities due both to prompt and delay effect, such as fallout and cloud phenomenology.

The report gives, mainly, the results of the work of Task Units 1 and 13. The other Task Units performed their work admirably, but that work was, in general, performed in order to lead to detonation of the device or in support of the work of Task Units 1 and 13. Reports on the work of other Task Units will be submitted at

* Castle Handbook

a later time.

Briefly, the results indicate that the yield of the [redacted] was 14.5 ± 1.5 MT,

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IRRELEVANT AND WERE NOT COPIED

[redacted]

at 6,000 ft from [redacted] zero. There is an inconsistency in the measurements at the two stations recovered in that the more distant station showed the higher activity. The neutron dose estimated from these measurements is about [redacted] rep at [redacted] ft.

Zr

Project 14.1 exposed Zr at all 14.1 stations. The Zr samples were counted in both 14.1 and in 2.3 equipment. The resume' of the data is shown in the graph, Fig. 2.3-1.

Au and Ta

Au samples recovered were too hot to count on [redacted]. First counts on the Ta samples give the thermal flux at the two points [redacted]

S and I

Sulfur and Iodine samples were returned to NRL. First count information indicates a flux of [redacted] (at 7,500 ft) above 3 Mev. Lead shielded samples of Iodine were not recovered from the stations involved, so Iodine flux values are not available.

Project 2.5a - FALL-OUT DISTRIBUTION STUDIES

Project Officer - E. R. Tompkins

The principal objectives of this study are the evaluation of the mechanism and distribution of fall-out from surface bursts

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Fig. 2.3-1 has been determined to be not declassifiable

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of nuclear weapons and the scaling and extrapolation of the effects of such bursts for other yields and environments.

No results can be presented at this time. Data to be employed for [redacted] shot evaluation include the following:

Fall-out sample activity and time of arrival data collected by this project (land, lagoon and buoy stations).

TU-7 monitor survey data.

Outer island survey data. A summary of this data is reported in Table 2.5a-1.

Wind profile data from Rongerik and Curtiss stations.

Gamma time-intensity and gamma exposure data from Projects 2.1 and 2.2.

TABLE 2.5a-1
SUMMARY OF MONITOR SURVEY DATA - OUTER ISLANDS

ATOLL	ISLAND	AVERAGE (mr/hr)	MAXIMUM (mr/hr)	TIME (days)
Rongelap	Eniran	600	1,000	≠ 7
"	Arbar	250	400	≠ 7
"	Rongelap	375	450	≠ 7
"	Busch	650	750	≠ 7
"	Enialo	500	800	≠ 7
"	Eniaetok	900	1,200	≠ 7
"	Erapuoten	1200		≠ 7
"	Anidjet	1400	1,600	≠ 7
"	Kabelle	2000		≠ 7
"	Eriirippu	2800	3,500	≠ 7
"	Lukuen	1500	1,850	≠ 10
"	Gejan	2550		≠ 10
"	Lamuiia	2550	2,900	≠ 10
"	Aerik	2550	2,900	≠ 10
"	Naen	3200	3,650	≠ 10
Rongerik	Eniwetak	280	300	≠ 9
"	Rongerik	400	450	≠ 9
"	Mortlock	450	600	≠ 9
"	Latoback	500	700	≠ 9
"	Bock	1000	1,200	≠ 9
Ailinginae	Sifo	100	120	≠ 9
"	Enibuki	120	140	≠ 9
"	Bokonikaiaru	140	160	≠ 9
[illegible]ar	Bikar	140	160	≠ 8
[illegible]tirik	Aon	40	60	≠ 8
"	Utirik	30	50	≠ 8

Project 2.5b - FALL-OUT STUDIES

Project Officer - E. F. Wilsey

The objectives of this project include the collection of fall-out samples for the documentation of the physical characteristics as a function of time and distance and to provide samples for chemical and radio-chemical analysis under Project 2.6b.

Little in the way of results can be given at this time since most of the sample studies are being carried out at CRL, Edgewood, Maryland.

A limited amount of data suggesting possible time-fractionation of the fall-out is presented in the accompanying graphs, Figs. 2.5b-1 and 2.5b-2, and is tabulated in Table 2.5b-1. It is noted that the fall-out collected at early times exhibits more rapid decay during the period B+5 through B+16.

TABLE 2.5b-1
POSSIBLE FALL-OUT TIME-FRACTIONATION

Station	Time Collected (hrs after zero time)	"n" *
[illegible]etokutoku	0.5	- 2.0
[illegible]2	0.5	- 2.0
[illegible]	2.5	- 2.0
[illegible]5	7.5	- 1.8
[illegible]n	4.5	- 1.6
[illegible]	10.5	- 1.7

* where "n" is the term in the expression: $I + kt^n$

[redacted]

DECAY CURVES OF 30-MINUTE IFC SAMPLES

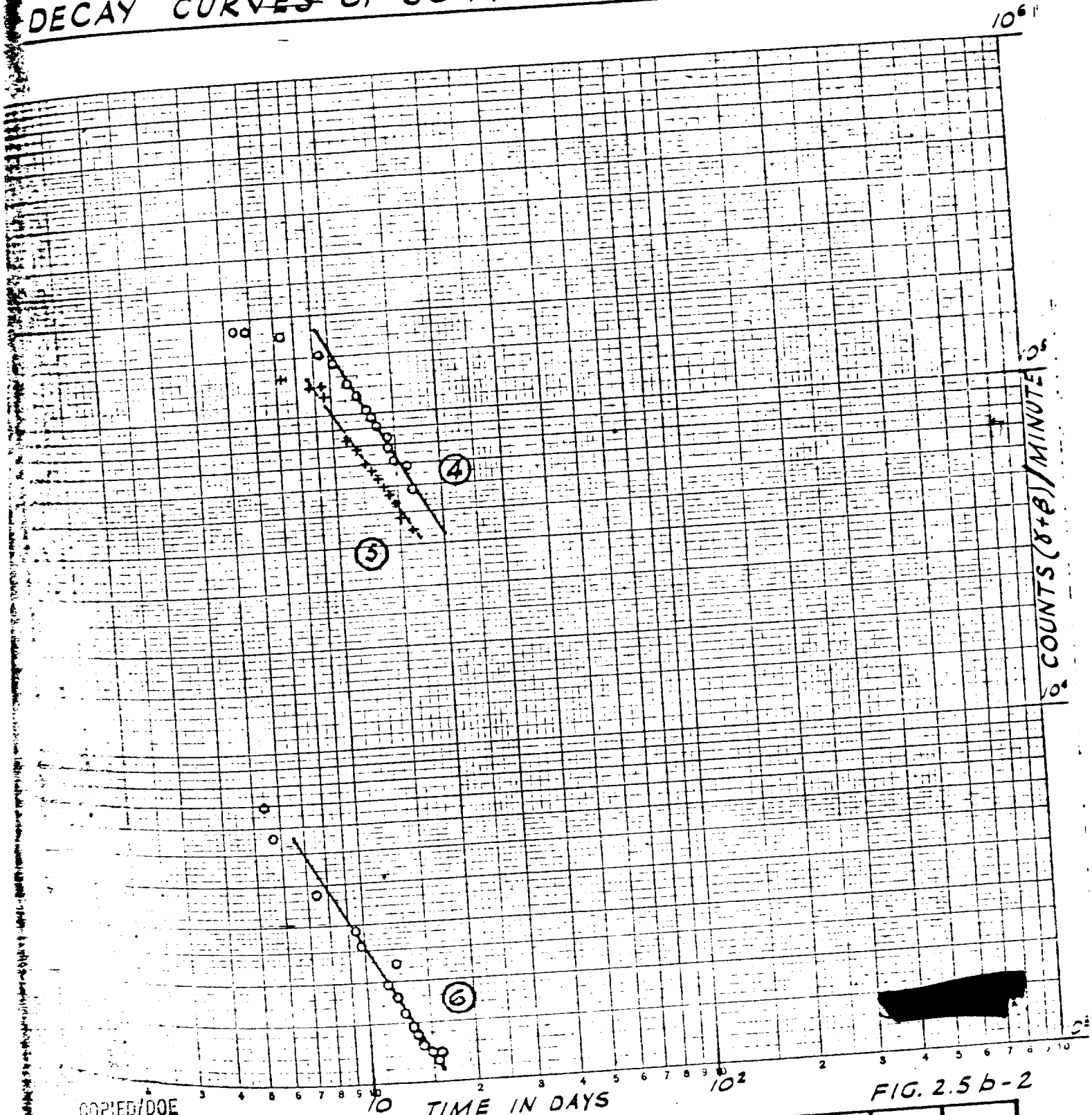

FIG. 2.5 b-2

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CURVE	STATION	TIME COLLECTED AFTER ZERO HOUR	Δ	n
④	BR-NA-3-6 ENYU	2.5-3 HOURS	63°	-2.0
⑤	3R-250.05-3-16 RAFT	7.5-8 HOURS	61°	-1.8
		0.25 HOURS	63°	-2.0

DECAY CURVES OF 30-MINUTE IFC SAMPLES

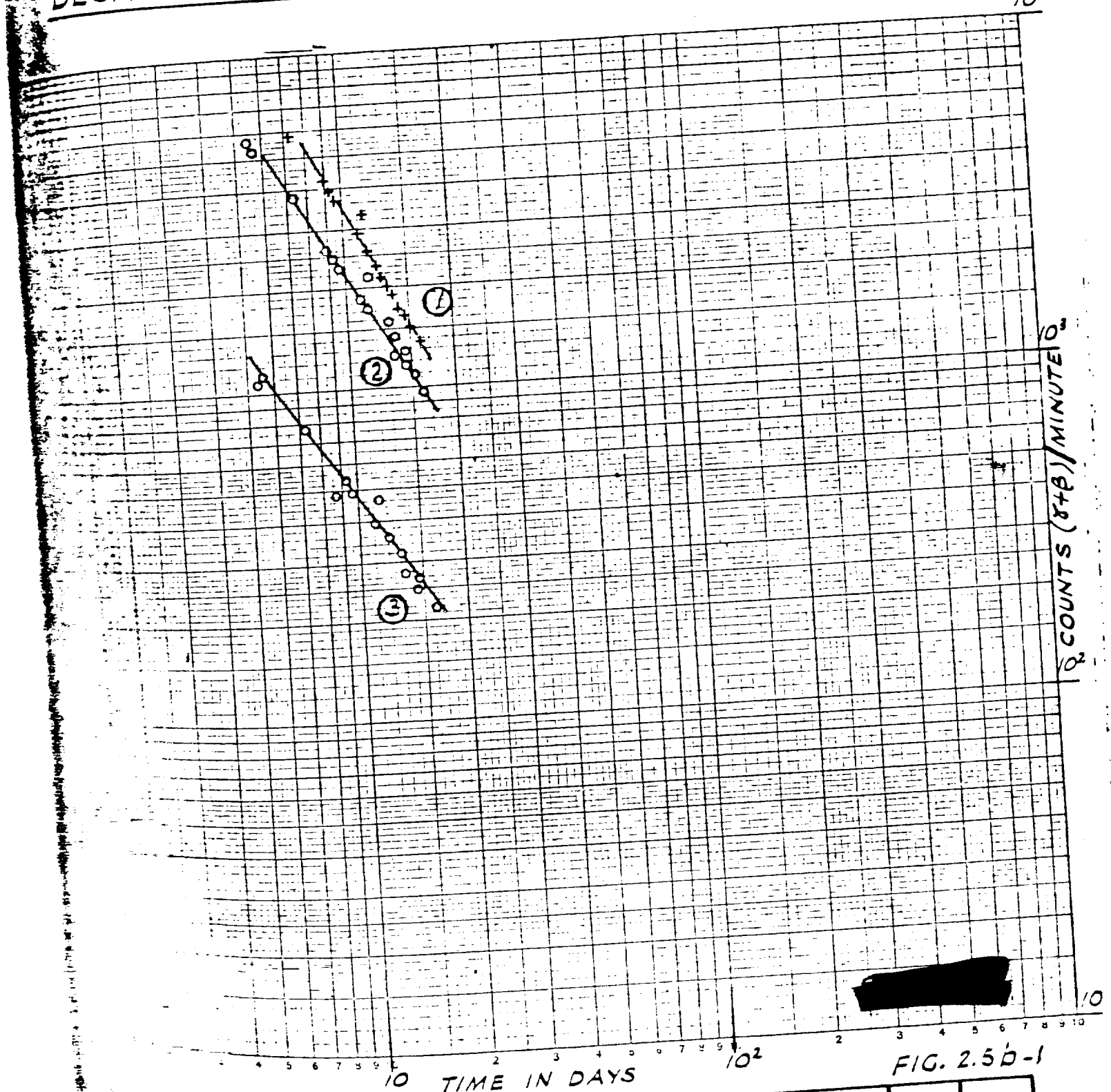


FIG. 2.5b-1

STATION	TIME COLLECTED AFTER ZERO HOUR	Δ	n
82-250.12 — 3-1 RAFT	0 - 0.5 HOURS	63°	-2.0
82-ZE-3-10 OURUKAEN	4.5 - 5 HOURS	58°	-1.6
82-TA-3-22 ENINMAN	10.5 - 11 HOURS	60°	-1.7

Project 2.6a - CHEMICAL, PHYSICAL AND RADIOCHEMICAL ANALYSIS OF SURFACE CONTAMINATION

Project Officer - E. R. Tompkins

Samples of fall-out were received at Parry on the afternoon of 6 March 1954. A total of 16 stations were recovered. On 6 and 7 March, the samples were aliquoted into three parts: (1) Treatment on site, (2) Radiochemical analysis at NRDL, (3) Chemical analysis at NRDL. Except for Station 251.09 which contained material from the tidal wave, the samples were a combination of material from three 1-gallon polyethylene collecting bottles. Gross analysis of the material is given in Table 2.6a-1. The slurry fall-out common to the raft stations appeared to consist of a slaked lime suspension. The island station samples contained large particles -- probably blown in by the wind or blast wave. Some of the collectors were wired in the open position; the liquid probably was rain water.

The following quantities were determined for some or all of the samples: (1) Gross beta and gamma decay of all samples, (2) Al and Pb absorption curves for a few of the samples, (3) Oxidation state and approximate amount of Np, (4) Oxidation state of iodine. In addition, the samples were used to complete the development of a method to separate and determine various induced activities of interest. The solubilization and fractionation of the activity (as gamma distribution) into three physical states (ionic, colloidal, and solids) was determined

by centrifugation and ultrafiltration. This information should be of assistance in interpreting: (1) the contamination-decontamination potentialities of the fall-out, (2) field measurements of dose rate (changes in and variations from source measurements), and (3) the chemistry of the gross fall-out.

Physical State Measurements

Two island station samples and one lagoon sample were treated. All three samples contained liquid and some solid (or slurry). The pH of the liquid was 9.0 for the lagoon and about 12 for the island samples. The percentage of solids by weight ranged from 1 to 10% but the percentage of gamma counts in the solid fraction was never less than 90%. The liquid fraction ran 95 - 97% ionic as determined by ultrafiltration. The colloidal fractions contained less than 1% of the total gamma activity. These results would indicate that a rain might, when sufficiently heavy, wash away about 10% of the gamma activity. Unfortunately, all the beta proportional counters burned out making it impossible to obtain similar comparisons for the beta activities.

Decay on the various fractions showed fractionation of the active material. For the total material between B+6 and B+15, a $t^{-2.07}$ decay was observed. Over the same period, a $t^{-1.9}$ to $t^{-2.2}$ deday was observed for the solid fraction whereas $t^{-1.0}$ to $t^{-1.8}$ decay was observed for the ionic fractions; the colloidal fraction followed a $t^{-0.6}$ to $t^{-1.9}$ decay.

[redacted]

Pb absorption curves, when analyzed into approximately two energy components gave a hard component of 1.1 to 1.3 Mev gamma for all fractions. The soft component of gamma for the ionic and solid fractions was about 0.2 Mev and about 0.3 Mev for the colloidal fraction. Table 2.6a-1 gives the gross analysis of fall-out material.

From B+6 to B+7, the iodine activity (gamma) was found to be associated with the solid fraction to the extent of 50 - 80%, with the majority of samples giving about 75% of iodine in the solid. The total F.P. iodine gamma activity was about 5% of the gross gamma at that time. Experiments indicate the oxidation state of iodine as being -1 in the solid.

Neptunium Activity

The Np separations gave an approximate yield of 85% (Np gamma count) of the total gross count by a one inch scintillation crystal thru 1600 mg/cm^2 of Al at B+8 to B+9. Using 80% Np and 20% F.P. and extrapolating back to B+5 hours by a $t^{-1.2}$ decay for F.P. and a 56 hour half-life for Np, one obtains a composite decay curve of about $t^{-0.7}$ from 5 to about [illegible] hours increasing to a $t^{-2.6}$ decay at B+8 - 9 days. However, using 66% Np and 33% F.P., one obtains a composite curve of $t^{-0.7}$ again at early times but which falls off less rapidly at longer times; the law at B+8 - 9 days in this case is about $t^{-2.1}$ (as observed on the gross samples at that time).

[redacted]

TABLE 2.6a-1
GROSS ANALYSIS OF FALL-OUT MATERIAL

Station	Total Wt. (gm)	Meter Reading at Surface of Bottle (3/6/54) (mr/hr)	Total Gamma Count (3/15/54) (counts per min.)	Description of Material
250.04	44.56	300	9.1×10^7	Slurry
250.05	185.95	300	1.8×10^8	Slurry
250.06	69.34	160	5.5×10^7	Slurry
250.17	44.70	2.5	5.7×10^5	Slurry
250.22	8.60	43	5.5×10^6	Slurry
250.24	111.93	33	7.9×10^6	Slurry
250.25	11.56	20	1.8×10^6	Slurry
251.02	120.69	240	8.6×10^7	Solid & liquid
251.03	46.37	500	5.0×10^8	Solid & liquid
251.04	2.54	350	8.7×10^7	Solid (wet)
251.05	107.01	13	2.7×10^6	Solid & liquid
251.06	4.60	27	2.7×10^8	Solid (wet)
251.07	0.80	1.1	9.0×10^3	Solid (dry)
251.08	1.12	22	—	Solid (dry)
251.09 (1)	1834.0	4.5	—	Seawater
251.10	1.50	2.4	2.8×10^5	Solid (dry)

(1) One bottle of 3

The ion exchange separation procedures of induced activities (halides and alkali metals) produced an unknown high peak in the elution curves. The activity peak was found to be pure Np. Further, the oxidation state of the peak must be that of NpO_2^+ (V). Obtained at B + 10, the peak contained about 10% of the total activity of the sample. However, other experiments showed the presence of other oxidation states of Np so that the fraction found is a minimum figure. The recovery, however, is estimated to be greater than 90% by this method, so that in future measurements, a more precise measurement of the Np can be made -- using the extraction procedures to obtain the relative amounts of the oxidation state.

Decay of the Gross Sample

The decay of all samples were the same within aliquoting and counting errors. This indicates that no significant fractionation of the activities occurred. The average relative decay for all samples is given in Table 2.6a-2.

TABLE 2.6a-2
GROSS SAMPLE DECAY

Time Elapsed (Days)	Gamma Decay (%)	Beta Decay (%)
	---	100.
	100.	80.8
	83.6	67.2
	65.3	52.8
	55.5	43.0
	47.0	36.2
	32.0	26.0
	28.0	23.2

Times taken as 0700, 1 March 1954.

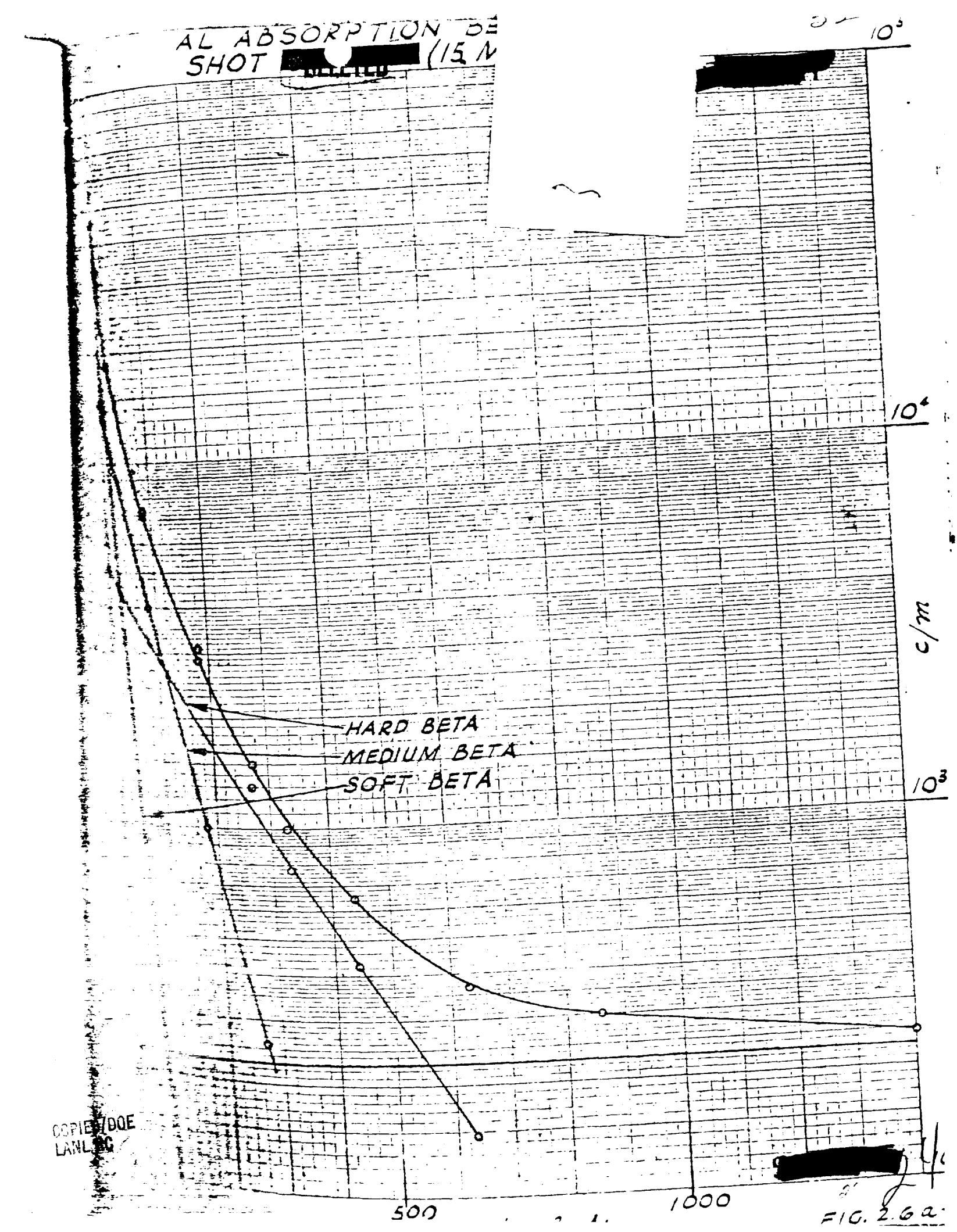
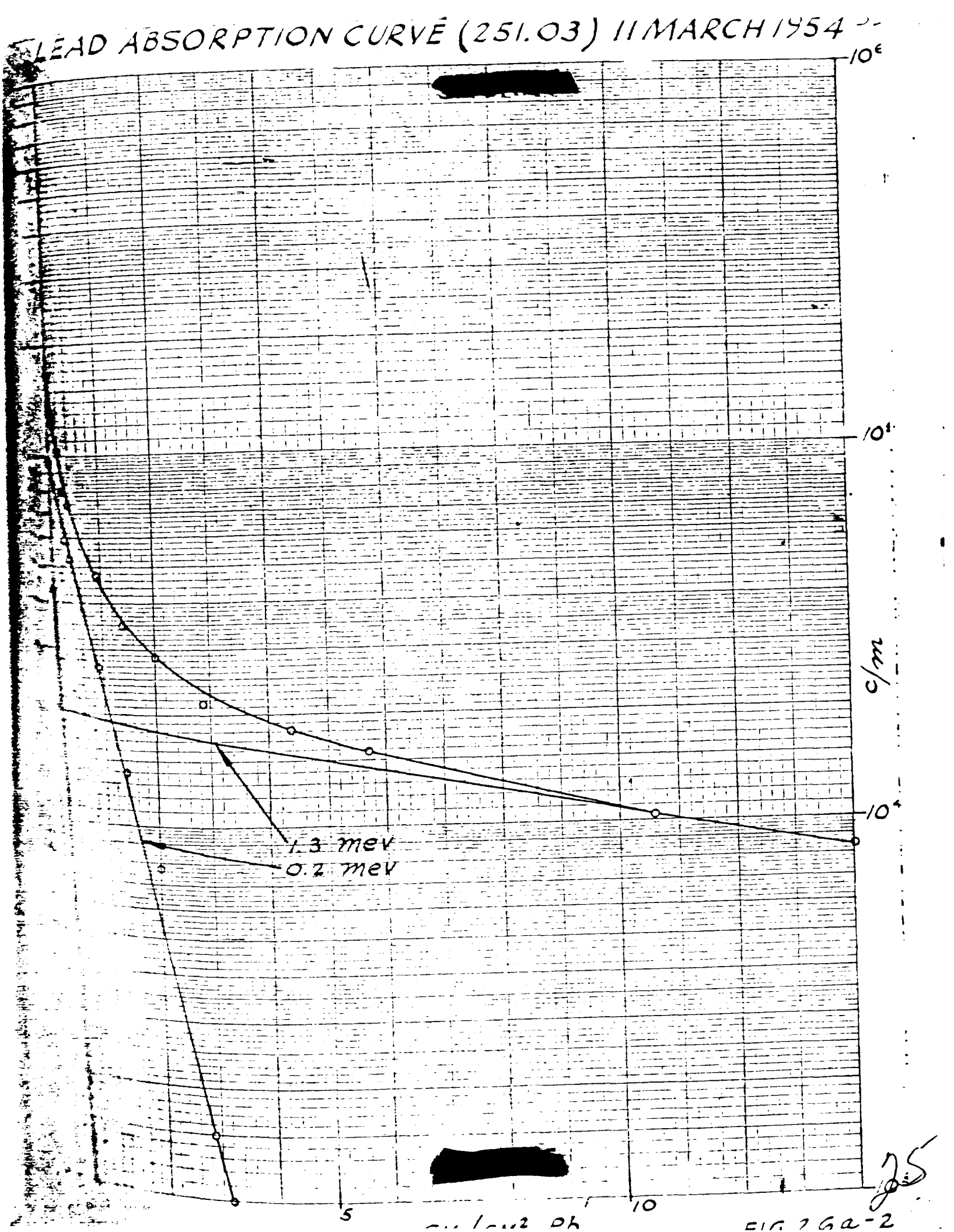
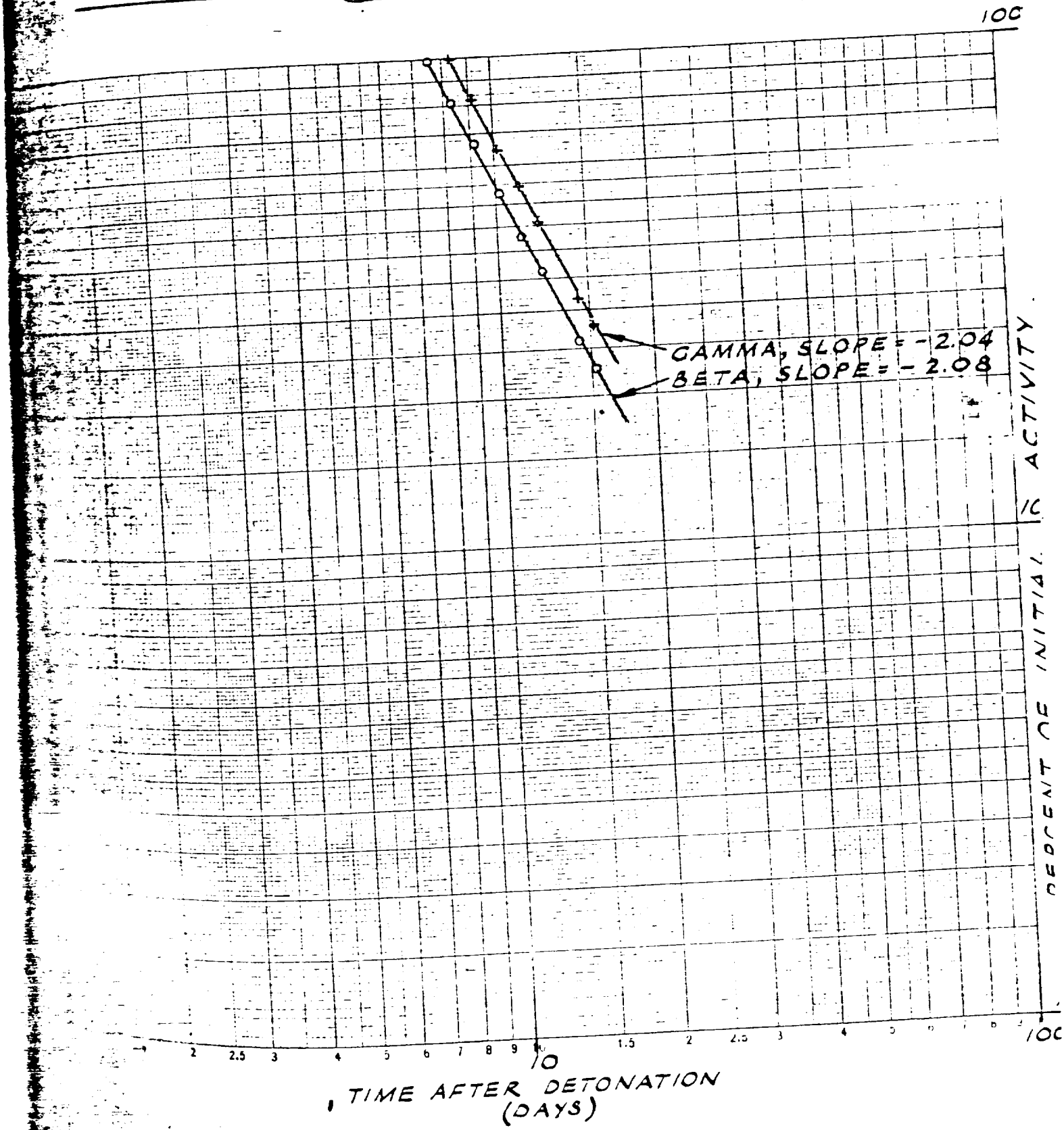


FIG. 2.6a


LEAD ABSORPTION CURVE (251.03) 11 MARCH 1954
10⁶
10⁵
10⁴
c/m
1.3 mev
0.2 mev
5
10
FIG 2 Ga-2

[redacted]

DECAY OF [redacted] SHOT FALLOUT



[redacted]

FIG 262-3

The gross gamma count decay follows a $t^{-2.04}$ law over the period while the beta count decay follows a $t^{-2.08}$ law. The beta measurements were made using a GM tube. Absorption curves and gross decay plots are included as sample exhibits of the data. (See Figs. 2.6a-1, 2.6a-2 and 2.6a-3)

Project 2.6b - RADIOCHEMICAL ANALYSIS OF GROUND CO

Project Officer - R. C. Tompkins

Objective

The objective of this project is to study variations in radiochemical composition of fall-out with particle size, zero point environment, time, and distance for application to the problem of the mechanism of fall-out formation.

Results

Preliminary figures are given on size-graded fall-out collected on Bikini Island. These figures are based on rapid calculations with no attempt to estimate precision or accuracy. They are subject to change in later work.

The sample was collected in a funnel having a top diameter of two ft. As a result of a failure in the electrical circuit, the cover did not close at the prescribed H + 5 hours, but remained open until recovered at B + 4 days.

Table 2.6b-1 lists the total activity, specific activity, and decay characteristics of the various particle size fractions at B + 7 days. The millicurie figures are based upon a RaE

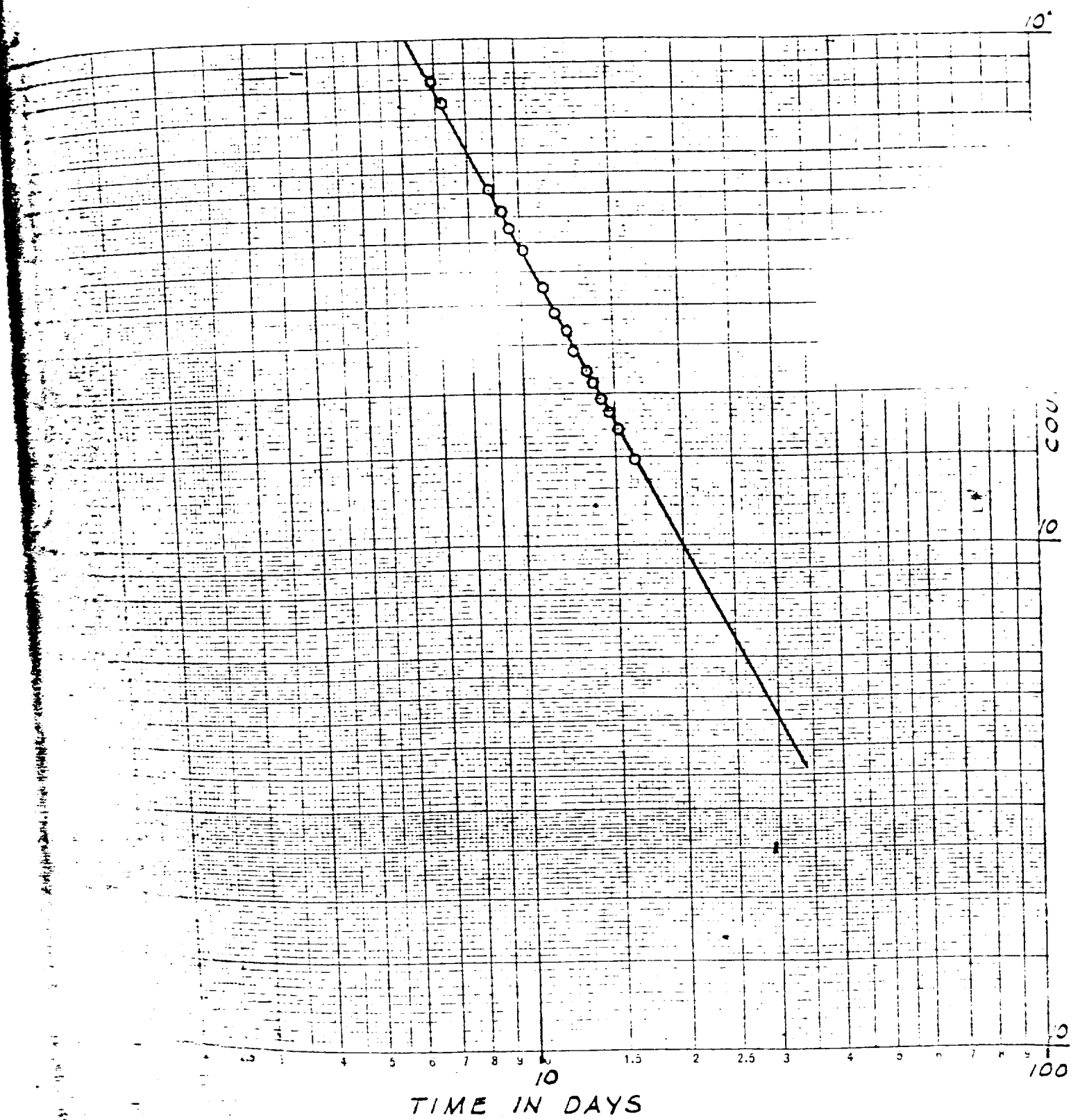
standard reference source, and are subject to considerable error. It is realized also that the expression of mixed fission product activities in millicurie units is of doubtful significance. The decay characteristics are expressed as values of n for the expression $I = kt^n$ and apply to the period from B + 7 to B + 16. An example of the decay curves obtained is shown in Fig. 2.6b-1. The other curves are virtually identical.

Table 2.6b-2 lists some estimates of the contribution of Mo^{99} and Na^{24} to the total activity at B + 7 days. The figure for Mo^{99} in the 62-74 micron range is the same as that given by Hunter and Ballou for thermal fission of U^{235}.

TABLE 2.6b-1
ACTIVITY- OF FALL-OUT AT B + 7 DAYS-BIKINI ISLAND

Particle Size in Microns	Total Activity in Millicuries	Specific Activity in Millicuries/ Milligram	Slope of Decay Curve
0 - 5	2.4×10^4	23	-2.0
5 - 10	9.9×10^3	25	-1.9
10 - 20	2.4×10^3	35	-2.0
20 - 30	1.2×10^4	28	-2.0
30 - 40	9.2×10^3	35	-2.0
44 - 53	2.0×10^4	29	-2.0
53 - 62	7.8×10^3	33	-2.0
62 - 74	1.3×10^4	26	-2.0
74 - 88	8.9×10^3	27	-2.0
88 - 105	9.8×10^3	24	-2.0
105 - 125	9.3×10^3	25	-2.0
125 - 149	1.2×10^4	21	-2.0
149 - 177	1.6×10^4	21	-2.0
>177	To be determined	To be determined	

DECAY OF 7-88 MICRON FALLOUT [redacted] SHOT



[redacted]

FIG. 2.6b-1

TABLE 2.6b-2

CONTRIBUTIONS OF INDIVIDUAL NUCLIDES TO TOTAL ACTIVITY AT B + 7 DAYS-BIKINI ISLAND

Nuclide	Particle Size	Per Cent Contribution
Mo^{99}	0 - 5 u	5.4
Mo^{99}	62 - 74 u	10.
Na^{24}	53 - 62 u	0.0087

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fuselage station 530 on the in flight refueling manifold passing thru the left portion of the fuselage section. Discussion with Major J.E. Bauer, the B-47 pilot, indicated that the refueling manifold had been used for fuel transfer from the auxiliary tanks to the main fuel tanks during the flight to the shot area without incident. This indicates that the coupling was torn as a result of the jolt it received after [redacted]

Instrumentation functioned properly.

The following data has been determined:

a. Q received (BUT/ft^2) = 184.7

b. Δ T in 0.020 aluminum = 392 F

c. Overpressure Δ p = 0.391 psi

Project 6.4 - PROOF TESTING OF AW SHIP COUNTERMEASURES

Project Officer - G. G. Molumphy, Capt., USN

Operational

Project 6.4 had a full participation in [redacted] shot. However, upper winds were adverse for contaminating the test ships, the main line of downwind contamination being across the lagoon. Commander, Task Unit 13 was advised six hours prior to shot time that success was difficult to predict. Very little contamination was obtained on BAKER Ship at about H+3 hrs. This is considered a clean miss as far as the purposes of the project are concerned.

All operations were performed satisfactorily. The ships answered all control signals. A dead-reckoning plot kept by the project officer was only two miles off when the ships were recovered. The ships passed through the initial station for the contaminating run at the scheduled time. A failur- control antennas on the control aircraft was overcome i.. Meanwhile, the secondary control station in HRS-12 aboar.. BAIROKO was airborne in order to initiate the Washdown System aboard ABLE Ship and to increase the speed of the lead ship. This was successfully accomplished in a 15-minute flight, after which the P2V-5 aircraft assumed control. In the next event participated in, the washdown will be initiated prior to shot time. Response of vessels ABLE and BAKER to command signals was determined, previously, by radar plot. This system, though adequate, requires an undesired time lag. For future operations receipt of the command signals for course and speed will be telemetered back to the controlling aircraft by utilizing the existing "Motorola" radio circuit.

One hundred and ninety detectors were placed in operation on ABLE; 203 on BAKER. There were only two failures per ship. Two recorder pens failed on BAKER but duplicate traces were obtained. Water flow meters and wind speed indicators operated satisfactorily. Data reduction is only partially complete at present; however, it does not appear likely that any reportable information on washdown will become available due to low activity levels.

No ship decontamination work was accomplished following [redacted]. Aircraft were removed from ships to Eniwetok Island for checking and cleaning. The aircraft were successfully operated, indicating no adverse effects of exposure to washdown.

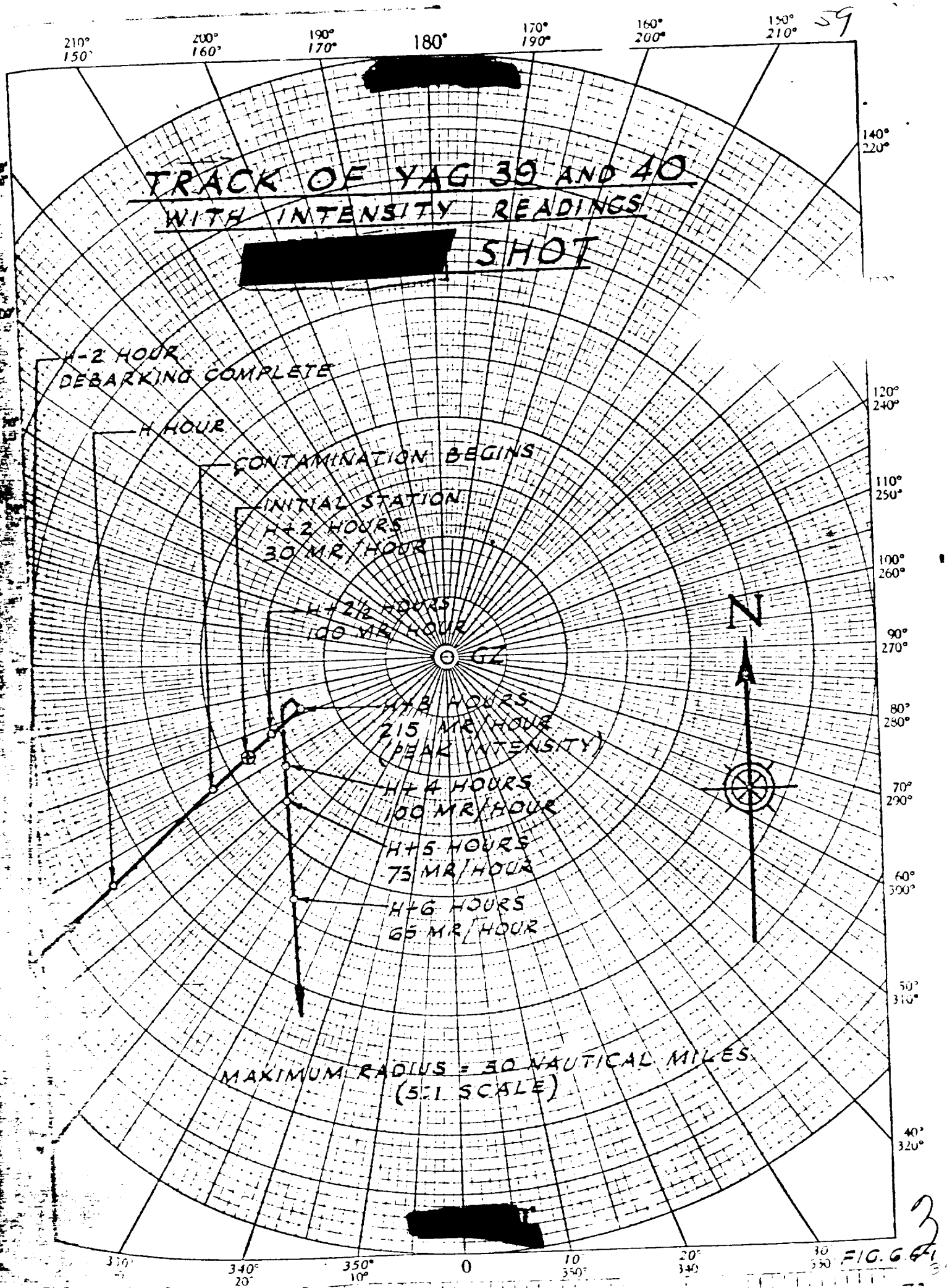
All air samplers in experimental ventilation spaces on BAKER operated satisfactorily. No airborne activity was observed. Six of seven air samplers in BAKER boiler air system did not operate satisfactorily. These samplers are being reconditioned with the exception of one unit which is being discontinued. Beta decay monitors were not operated on this run.

No reportable information is available from the remainder of the project; primarily because of low activity levels. Project 6.4 is planning to participate in the [redacted] shot.

Technical

One of the shipboard ion chamber-recorder units was placed on Rongerik Island for operational check in case the ships were unable to participate. The recorder registered first fall-out at H+40 minutes rising sharply to a 240 r/hr peak by H-1 hr, then decaying as a t-1.0 law.

Fig. 6.4-1 is a plot of the ships course with the intensity readings from the [redacted] superimposed to show intensity and position relationship.


TRACK OF YAG 39 AND 40
WITH INTENSITY READINGS
[redacted] SHOT
H-2 HOUR
DEBARKING COMPLETE
H HOUR
CONTAMINATION BEGINS
INITIAL STATION
H+2 HOURS
30 MR/HOUR
H+2½ HOURS
100 MR/HOUR
GZ
H+3 HOURS
215 MR/HOUR
(PEAK INTENSITY)
H+4 HOURS
100 MR/HOUR
H+5 HOURS
75 MR/HOUR
H+6 HOURS
65 MR/HOUR
MAXIMUM RADIUS = 50 NAUTICAL MILES
(5:1 SCALE)
N
[redacted]
210° 150°
200° 160°
190° 170°
180°
170° 190°
160° 200°
150° 210°
140° 220°
120° 240°
110° 250°
100° 260°
90° 270°
80° 280°
70° 290°
60° 300°
50° 310°
40° 320°
330°
340° 20°
350° 10°
0
10° 350°
20° 340°
30° 330°

59

3

FIG. 6.64

Project 6.5 - DECONTAMINATION AND PROTECTION

Project Officer - J. G. Maloney

Panels did not receive sufficient contamination to warrant decontamination study.

Project 6.6 - IONOSPHERE STUDIES

Project Officer - A. Giroux, Capt., USA

Operational

The Okinawa C-2 recorder was operated from H-5 min. to H+5 min. and H+3 hrs. to H+4½ hrs. Data seems to be significant only in the early period.

The Guam C-2 recorder was operated from H+1½ hrs to H+2½ hrs. Data has not yet been evaluated but appears to be insignificant.

The Rongerik C-3 recorder was operated from H-5 min. to H+1 hr., then at 15 sec. intervals, 5 times per min. until H+6 hrs. The records have not been completely evaluated but it appears that some significant results were obtained. The film was developed prior to abandoning the Rongerik stations.

The Parry C-2 recorder operated from H-5 min. until H+5 min., then 5 times per min. until H+1½ hrs. at which time it failed due to water in the gasoline. The Station resumed operations about H+1 3/4 hrs. and shut down at H+3½ hrs. The station was not functioning properly so data may not be significant.

[redacted]

Technical

The prints shown in Figs. 6.6-1 through 6.6-6 indicate typical results of the Rongerik station. Evaluation of data is performed by the Technical Project Officer in the ZI. Therefore, the actual significance of the result will not be available until a later date.

Discussion

To evaluate the ionosphere stations, a comparison must be made between shot day records and the daily history of the ionosphere layers. This history was compiled from 2-30 days and is continuing on all but the Rongerik station.

[redacted]

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Project 11.2 - CLOUD SAMPLING

(H. Plank)

Aircraft Sampling

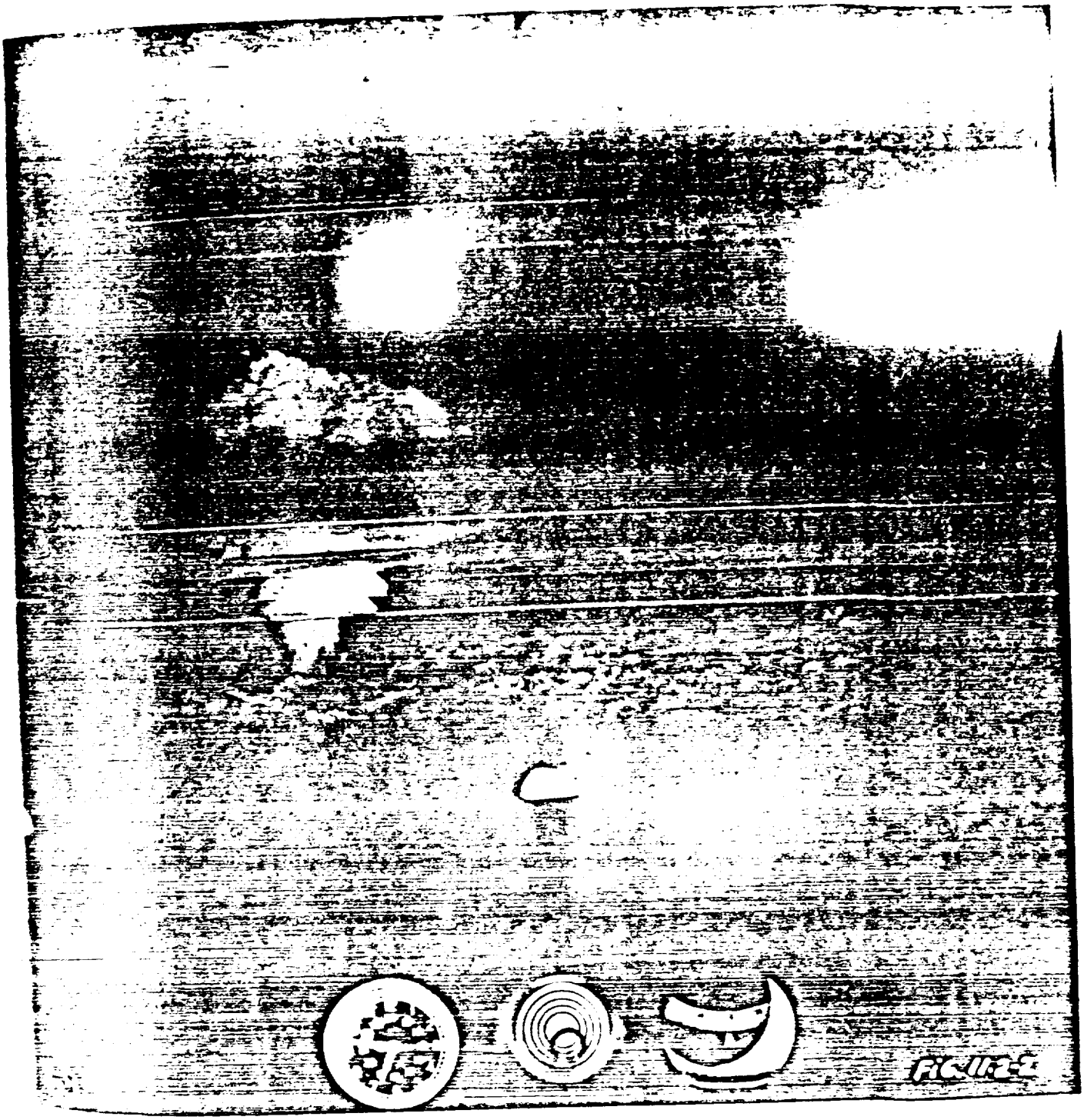
The cloud at sampling altitudes was initially obscured as the result of the consolidation of high (50,000 - 60,000 ft) and middle (35,000 - 38,000 ft) layers of broken to scattered cirrus. After a clear area under the upper cloud near zero point was found by the control RB-36, sampling operations proceeded normally and satisfactorily at all altitudes until completed. Progressive consolidation of the above layers of cirrus clouds at relatively early times as seen from the control RB-36 (from the East) is shown in Figs. 11.2-1 through 11.2-3. In Fig. 11.2-4 at H+25 minutes the lower cirrus banks can be identified with those in the earlier views in addition to the widely spread upper cloud as seen

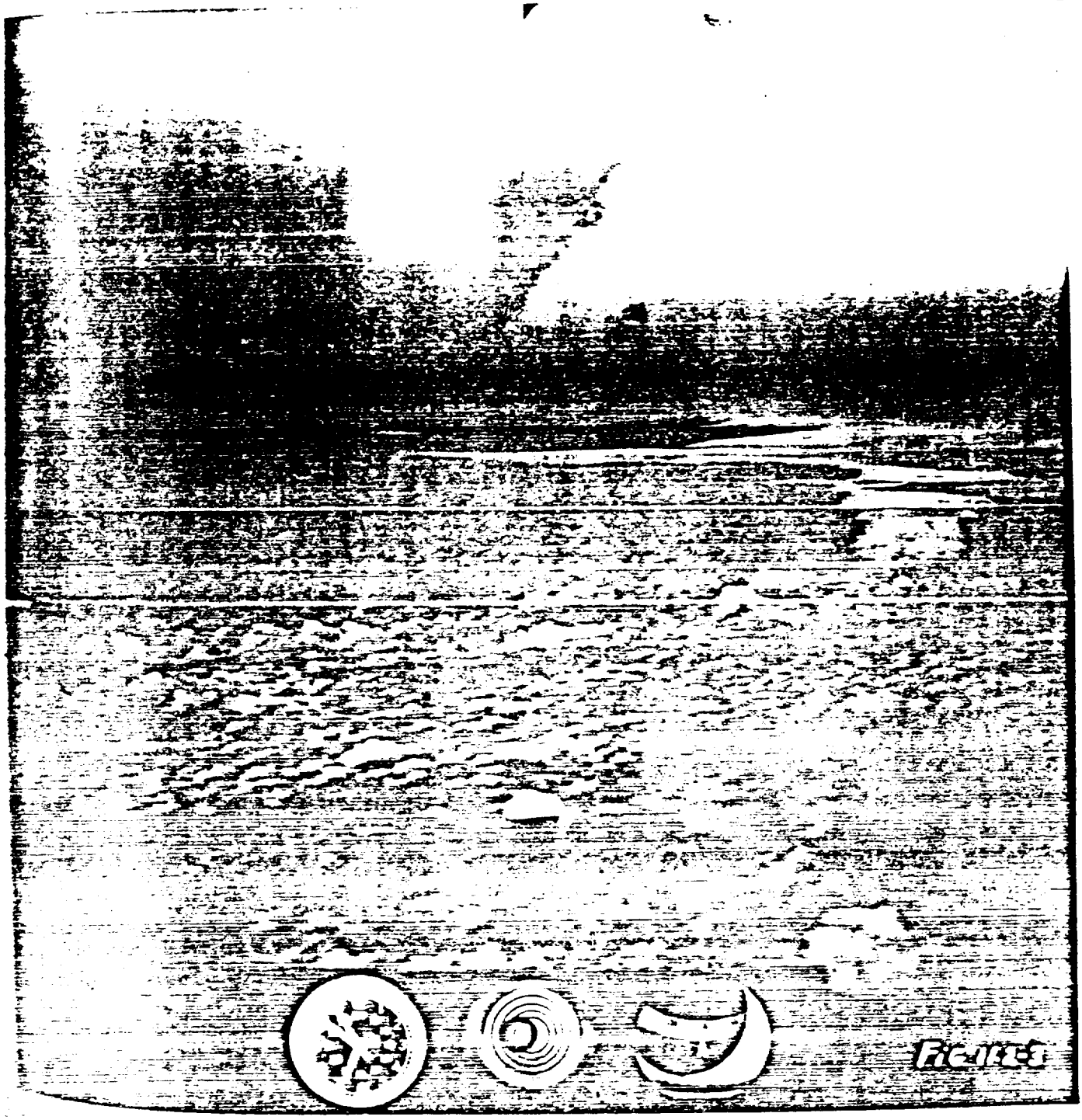
from a southwesterly position. (Pictures from Project 9.1.)

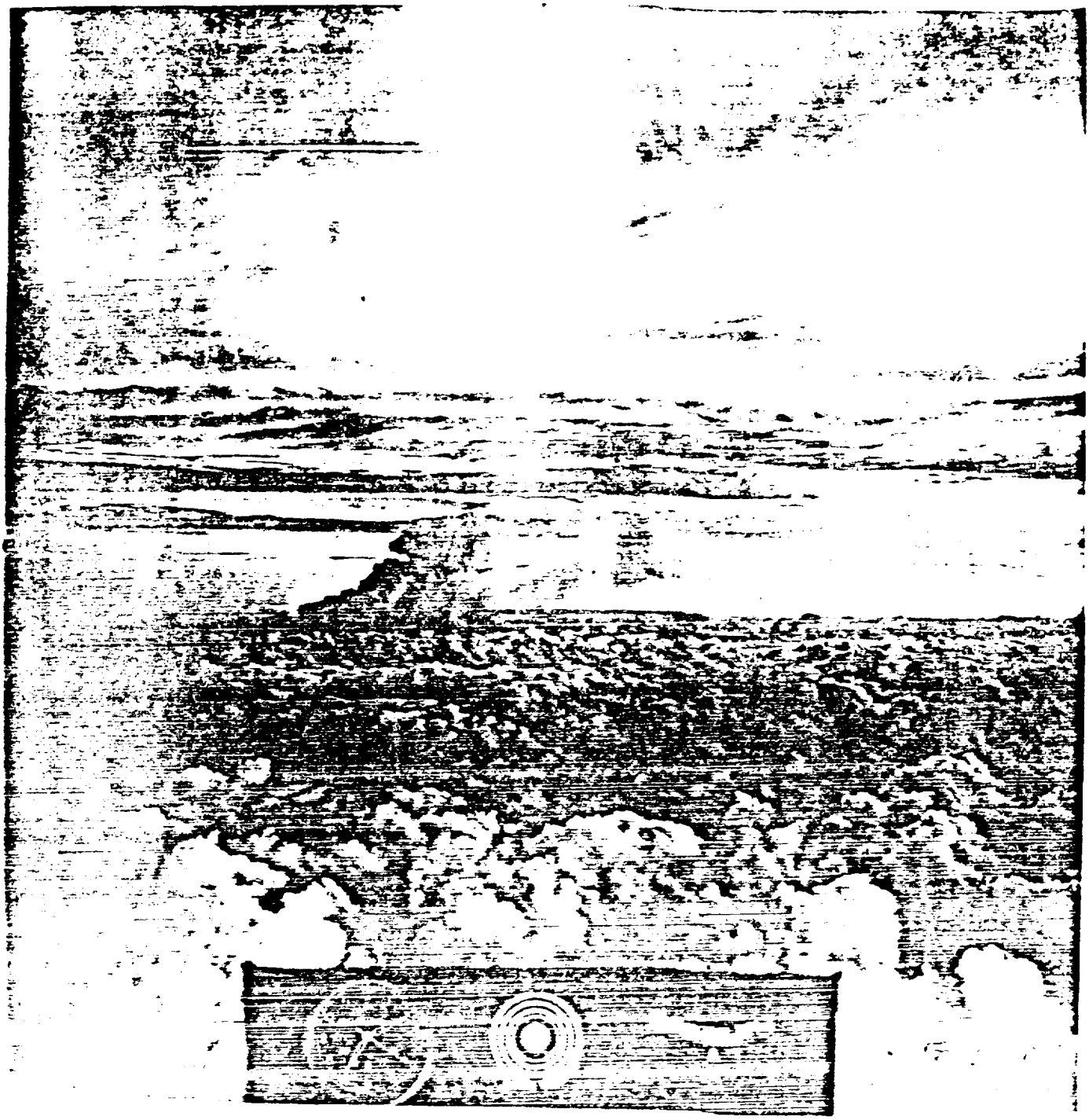
Preliminary results and associated data from the sampling project are presented in Table 11.2-1. Sample sizes from Mike shot for corresponding aircraft are also presented in this table for comparison. In contrast to Mike shot realistic control procedures developed by the present Task Group were so flexible that the cloud sampling program was not compromised by an unforseen and temporary loss to the Air Task Group Commander of many of his surface facilities for aircraft control in the middle of sampling operations. The maintenance of visual contact from the RB-36 with areas of the cloud to be sampled required the expenditure of approximately 0.9 roentgen exposure from radiation shine from the upper cloud.

Airborne radiation instrumentation worked well. Fig. 11.2-5 shows the effects of improving the energy response of these instruments by the good correspondence of radiation intensities in the cloud with an intensity vs time curve derived from Mike data. The lack of time dependence in ratios comparing radiation exposures based on film badges and ionization chamber-type electronic dosimeters (LASL Integrons) indicate these badges have energy response characteristics suitable for radiation from the debris of devices being tested at Castle. A study of the energy spectrum in the present clouds as a function of time by means of film badges

FIG. 11:24

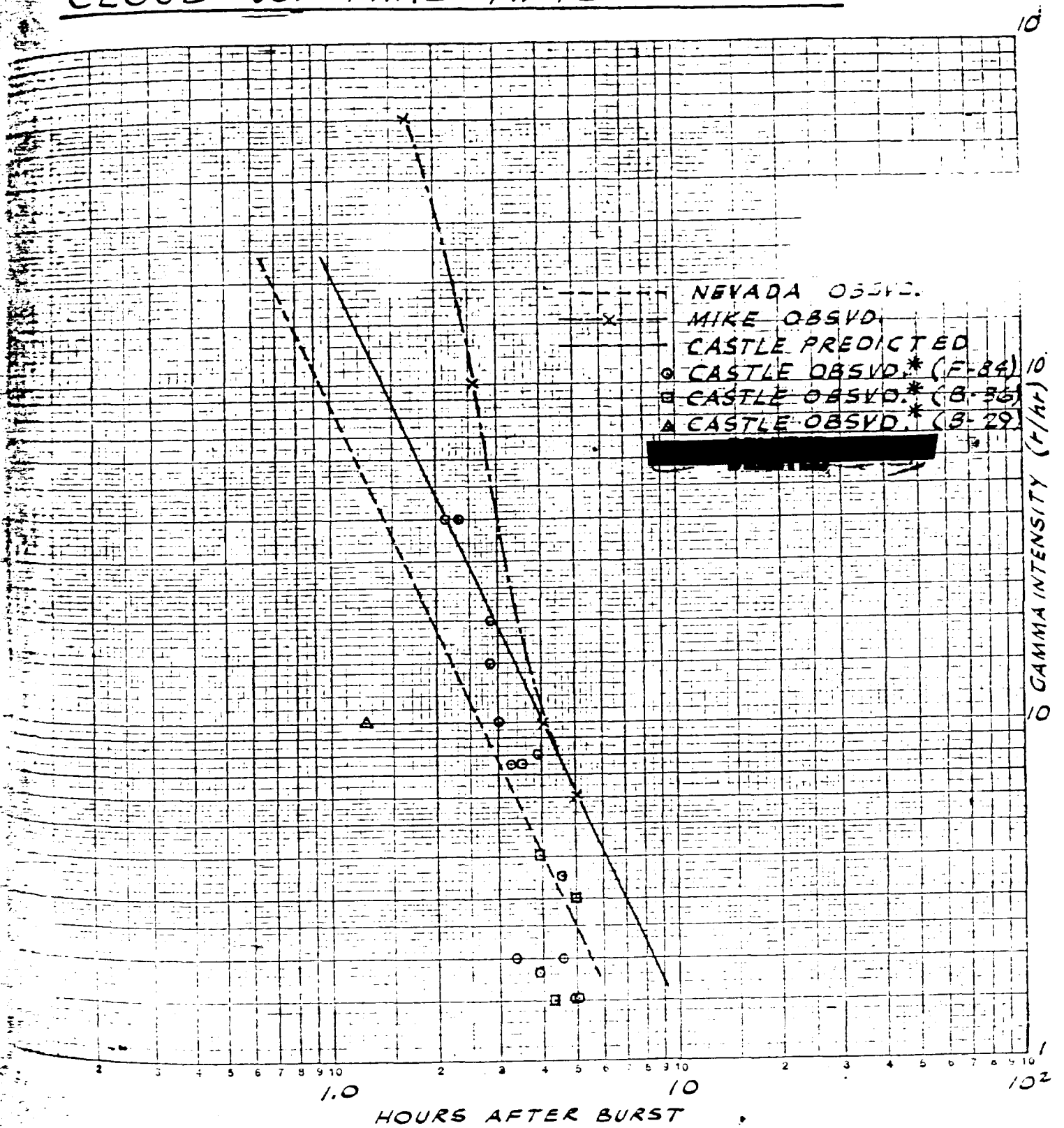






[redacted]

GAMMA RADIATION INTENSITY IN CLOUD vs. TIME AFTER BURST



[redacted]

43

FIG. 11.2-5

wrapped with lead foil of various thicknesses indicates a complex gamma spectrum. The approximate average energy at H+4 - 5 hours (based on absorbers up to a quarter-thickness) was found to be 0.43 Mev.

Still photography taken by Project 11.2 from the RB-36 was ineffective. The 16mm color motion picture p[illegible] phy has yet to be reviewed.

Ground Sampling

Four of the five funnel-type fall-out collectors in the Bikini lagoon were ruined by damage to the rafts on which they were placed. The fifth collector was recovered at about H plus one week. The sample was given to Program 7 for particle studies. The two blower-type collectors on Ourukaen Island, Bikini Atoll, survived the blast effects well and functioned successfully. Analysis of these samples by J-11 [redacted] UNLISTED [redacted] comparison for each, with a capture to fission ratio of [redacted] with [redacted] reported by Project 11.1. Unfortunately, the fall-out on Ourukaen was so light that the samples were small.

SAMPLING RESULTS FOR [redacted] SHOT

Aircraft Code	Type Aircraft and Number	Avg. Sampling Time (Hrs. after Burst)	Part of Cloud Sampled
Red 1	F-84G 030	2:07	West Side
Red 2	F-84G 037	2:20	West Side
Red 3	F-84G 032	2:45	East Side
Red 4	F-84G 049	2:45	East Side
White 1	F-84G 033	3:15	West Side
White 2	F-84G 051	3:15	West Side
White 3	F-84G 046	3:50	East Side
White 4	F-84G 053	3:50	East Side
Blue 1	F-84G 038	4:45	West to Ctr
Blue 2	F-84G 042	4:45	West to Ctr
Blue 3	F-84G 043	4:50	East to Ctr
Blue 4	F-84G 045	4:50	East to Ctr
Floyd 1	FB-36 1086	4:00	West Upper
Floyd 2	FB-36 1083	5:00	Ctr Upper
Wilson 1	WB-29 7335	1:20	West Lo Stem

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TABLE A-1

WEATHER (BIKINI ATOLL) AT 0600M, 1 MARCH 1954

Surface Pressure 1006.1 mb.
Surface Temperature 80° F.
Surface Humidity 77%

Altitude (kft.)	Wind Direction	Velocity (knots)
Surface	060	12
1	070	17
2	080	18
3	090	17
4	090	14
5	100	9
6	120	4
7	310	4
8	310	5
9	320	7
10	310	10
12	300	7
14	290	14
16	290	13
18	280	13
20	260	19
25	260	19
30	250	26
35	240	35
40	230	35
45	250	45
50	250	31
55	200	16
57	340	27